

## Emotional Subjects: Motivation and Emotion in Collaborative Science

Jennifer Tucker, 31 July 2008 - DRAFT

This dissertation proposal outlines a conceptual framework and proposed approach for studying the role of motivation and emotion in decision-making and action in science and technology. The goal of this research is to explore the connections and transmission patterns between the very personal emotions and motives that influence individual action and decision, and the social level norms that set the standards for behavior and action in a specific social world.

To explore this topic, I wish to study a large-scale cancer research program funded by the National Institutes of Health's National Cancer Institute. The goal of the program is to encourage interoperability and data sharing between the cancer research tools used by diverse, and previously highly independent, cancer centers across the U.S. The importance and difficulty of encouraging data sharing across centers has been recognized by the program, and they are working hard to remove the barriers. Given that these barriers are both personal and emotional, and structural and institutional, this appears to be an ideal site for my work.

Data sharing is both a personal decision and a social level problem. As such, it serves as an ideal case study for a pragmatic treatment of the theoretical feminist constructs of standpoint epistemology and partial perspectives. How does subjective knowledge, including personal experience, about data sharing both inform – and get informed – by objectified social level discourse about the benefits and challenges of data sharing? My proposal outlines the research methods I wish to use to address this question, as well as the contribution I believe this research will make to the broader field of STS.

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## **1. Introduction**

This dissertation proposal outlines the conceptual foundation and a proposed strategy for studying motivation and emotion in decision-making and action in science and technology. My research begins with the premise that motivation and emotion are key elements of what it means to be human, and consequently, are important variables in how individuals make decisions and take action. “Emotions...saturate human existence through the lifespan...They can be essential ingredients for, as well as overwhelming obstacles to, optimizing human potential” (Lewis and Haviland-Jones, 2004). Emotions are an omnipresent factor in all of our daily lives – including the lives and work of scientists and technologists.

This premise does not deny the presence of social factors in mediating or influencing human activities. Rather, I am interested in the possibility of mapping social level norms and interests to the motives and emotions expressed by scientists and technologists. A review of the literature suggests that while motivation and emotion has been richly researched in other disciplines, this area has had limited coverage by the science and technology studies (STS) community. Despite this, there is a stable conceptual STS platform from which to launch. STS literature is rich with compelling case studies that have “unpacked the technical” to reveal deeper interests. My interest lies in unpacking these interests to get to the more personal motivational and emotional elements driving individual decision-making related to these norms.

While questions related to motivation and emotion could be applied to a range of science and technology activities, I propose to focus my attention in the realm of one specific case study: the motives and emotions associated with decisions and actions related to scientific data sharing among cancer researchers.

This proposal includes the following elements. First, I articulate the problem statement and overarching questions that lie at the heart of this research, and outline the importance of this topic. Next, I provide a conceptual framework and toolset for the research project I propose. This includes a review of critical literature including: literature related to the linkages between my topic and existing STS literature, literature pertaining to my specific case study, and literature that has shaped my proposed research methods. Third, I describe my proposed research methods to implement this research. Finally, I discuss boundaries of my study, to help bracket the scope and focus of my work.

## 2. Research Questions and Case Study

My research begins from the standpoint that motivation is what inspires action and direction towards a certain goal, and that emotions are the subjective feelings that occur when motives are either fulfilled or not. My project is not to explore or validate the various definitions and interpretations attached to the terms motivation or emotion, or their relationship to each other. Instead, I am interested in a more pragmatic and functional treatment of these terms – where motivation is seen as a driver for action; and emotion is the subjective feeling that either precedes or results from that action. For the purposes of this research, I assume a close connection between the two: positive or negative emotions may motivate one to take an action; once that action is taken, positive or negative emotions may result.

### 2.1. Core Questions

The following macro-questions serve as starting points for framing this work:

- How does personal motivation and emotion interplay with social norms and public discourse? How different are the personal motives underlying decisions and actions from the social norms related to those same decisions and activities? Where do personal motives and public arguments overlap, and where do they differ?
- What are the possible methods for studying and answering these questions? How do we detect the connection between personal meaning and the social process of science and technology? How do we “map” motives and emotions in socio-technical exchanges?
- Based on findings from the first two questions, what advice might we give those wishing to influence the motives and emotions of those engaged in science and technology?

Three points of emphasis lie in these questions. First, I am interested in exploring research approaches for revealing dynamics related to motivation and emotion. This is a question of *methods*. Second, I am interested in analyzing the output from these methods to better understand motivational dynamics, and how they influence science and technology activities. This is a question of *results*. Third, I am interested in proposing how these results point to possible ways of influencing the process of science. This is a question of *advocacy*.

## 2.2. Overview of Proposed Case Study

To explore these questions, I propose focusing on the case study of scientific data sharing in the field of cancer research. What motives and emotions are linked to the personal decision to share one's research data, and how do these motives and emotions align – or not align – with social norms and discourse related to the benefits of data sharing?

My proposed case study for this work is a large government program led by National Institutes of Health's National Cancer Institute (NCI), Center for Bioinformatics and Information Technology (CBIIIT). The program is called the "Cancer Biomedical Informatics Grid," (caBIG™); its mission is to develop and deploy a "world wide web" of cancer research, allowing cancer researchers to share both tools and data among cancer centers to facilitate scientific discovery. The premise underlying this program is that increased collaboration and data sharing will lead to "better science" and – ultimately – faster and more targeted cures for cancer (National Institutes of Health, 2008).

The caBIG™ program is designed to demonstrate that the sharing of research tools (software) and data among cancer research institutions is preferable to each institution developing its own tools, in the traditional "Principal Investigator" model of scientific research. For example, a tool commonly developed by individual cancer centers is a tissue banking system that catalogues and tracks biospecimens collected from cancer patients. Tissue banking systems that are interoperable between cancer centers (locally owned systems that can exchange meaningful data with other local systems) allow cancer researchers to identify biospecimens and associated data held by other researchers, and share information about the specimens and data that they themselves hold. This sharing increases the pool of biospecimens and data available for research projects – a larger population, it is argued, will lead to better science, because more factors across diverse populations can be studied with statistically significant results.

From the outside, evolving from an individual model of cancer research to a collaborative model across institutions seems natural. With the advancement of information technology tools and the availability of the Internet to share information, increasing collaboration across networks seems like an obvious choice. This shift, however, is by no means inevitable. The specialty of biomedical informatics, upon which much of cancer research rests, is a complex merger of biological research, medicine, and information technology. The technical difficulties of aligning data vocabularies, practices, tools, and standards across a distributed community are

challenging on their own – doing this within a legal environment that protects patient privacy at all costs, and within the traditional individual contributor rewards structure of U.S. science, is even more of a challenge. As one researcher noted:

"We're asking researchers at many competitive institutions to tear down barriers to sharing vast amounts of data," says Howard Bilofsky, senior fellow at the Center for Bioinformatics at the University of Pennsylvania, which participates in NCI's project. "Being able to share information in grids across the world in the arena of life science research is not something easily done." (Mashberg, 2006)

The caBIG™ program is an ideal research site for a number of reasons. First, data sharing across institutions has been acknowledged as a vital element of the success of the program, and a workgroup has been established specifically to discuss the regulatory and proprietary issues associated with data sharing. This provides both a “laboratory” environment for conducting research, as well as access to individual researchers that both contribute to the public discussion and have motives and emotions of their own related to data sharing. Second, this program is an open access program, meaning that most meetings where data sharing issues are discussed are open to the public, and therefore accessible for research. Third, the program provides access to a variety of researchers from different kinds of organizations with potentially different perspectives related to data sharing. This diversity, still rooted within the domain of cancer research, allows both control and flexibility in my work.

### **2.3. Contribution to STS and the Broader Importance of Topic**

Many STS case studies have focused on unpacking the norms and interests that underlie scientific decision-making and action. Feminist studies have extended this with the tools of standpoint epistemology and partial perspectives: vital forces in shaping different forms of knowledge. A current research gap, however, is the next step deeper into the more personal and subjective motives and emotion that drive scientific and technology work. How does personal motivation and emotion contribute to, and how are they influenced by, social norms and interests? By learning more about how a range of motives and emotions impact the development of science and technology, we continue to broaden our understanding of the social dimensions of these activities.

This topic is also important because, while this research study is focused in the specific domain of cancer research, data sharing is a complex problem across multiple scientific and technical disciplines. As new technologies evolve that facilitate the transmission of data between

systems and people, the very personal decision to share data should be more closely considered and addressed. Data sharing is a personal decision – and a shared social problem. Understanding these dynamics can make our understanding of the norms and counter-norms of science more complete.

The 2007 book “The Secret History of the War on Cancer” (Davis, 2007) provides a compelling argument of how the driving factors of institutional politics and economics have shaped cancer research. This STS history, however, paints researchers primarily as powerless agents motivated by Marxian materialism and the fear of being displaced from their careers in uncertain times. How do researchers today, who are now part of that ongoing experience, describe their own choices, fears and ambitions? How do their personal stories of choice either validate or differ from social-level analyses such as Davis’? This is an unexplored arena that deserves individualized attention.

#### **2.4. Researcher Positioning**

My research interest is shaped by a set of values that influence how I approach my work. I started my career as a scientist, and left it because I was unable to connect the research I was doing with the needs of people. Now, I am in a new career as a leadership and team development consultant. Much of my work is with scientific and technology groups, which shapes my thinking about the motivations and emotions of these professionals. Since January 2006, I have supported the program that I wish to use as a case study. My project work as a participant observer has provided me with unique insights, resources and access to a network to support the research proposed here.

#### **3. Conceptual Framework**

There are three elements of my conceptual framework. The first element addresses how a study of motivation and emotion in science and technology would draw from conceptual and methodological resources from existing STS and related sociological literature. The second element explores literature related to data sharing, specifically in the area of bioinformatics. The third element focuses on literature that have helped frame my proposed research methods for my topic.

### 3.1. Conceptual Resources from STS and Sociology

This section grounds my proposed research in existing STS resources, which form a conceptual toolbox for my work. These resources include (a) norms, counter-norms, interests and rewards; (b) feminist perspectives; and (c) Actor Network Theory and Interaction Rituals.

#### Norms, Counter-Norms, Interests and Rewards

At the conceptual heart of my work lies the foundational work of Merton and Mitroff in the area of the norms and counter-norms of science. These two works reflect a profound tension between the impersonal and the personal character of science (Merton, 1973 and Mitroff, 1974). I believe this tension exists because they reflect a natural motivational continuum extending from impartial rationality to a more passionate subjectivity. How are these norms and counter-norms reflected in the arguments used to discuss data sharing, both at an individual level and at a social one? One of my research hypotheses is that the norms and counter-norms reflect a range of motives that are *all* experienced by scientists and technologists over the course of their work – the norms and counter-norms do not reflect an either-or choice; they are both present. The question thus becomes: how are they expressed and exchanged, and to what end?

Work related to interests and reward structures also provide a launching point. While vital in revealing socio-cultural dynamics, interests and rewards generally focus on the *positive and internal* social-level motivators shaping the work of scientists, such as the community recognition associated with publication in a prestigious journal, or the continued funding that may come when questions are framed in ways of interest to particular industrial or political groups. STS work related to interests and rewards are generally framed at a social level and generally over a long-term perspective, rather than at the level of specific actors and the diversity of motives and emotions that may be felt within a single research project.

One could argue that social level interests are not only linked to the positive emotion of pride associated with rewards, but also to the negative emotion of embarrassment or fear, which could come when from *not* getting rewards. In “Fear: A Cultural History,” Joanna Bourke argues that *fear* is the most pervasive emotion of modern society, and that this emotion shapes much of how we construct our life (Bourke, 2006). Along these lines, in “Master Passions: Emotion, Narrative and the Development of Culture,” Moldoveanu and Nohria point to anxiety, envy, greed, and jealousy as key cultural drivers in human activity (2002). Surely, scientists and

technologists are not immune to these dynamics – the question is, is it possible to elicit these feelings and their impact on the data sharing problem?

### Feminist Perspectives

Feminist resources are also critical to the construction of my research. Motives and emotions are ultimately individual and subjective, leading me to connect them with both Harding and Haraway's ideas related to strong objectivity, standpoint epistemology, partial perspectives, and local knowledge. These authors call for an approach that blends institutional (e.g., the best objective) knowledge with the more contextual knowledge provided by the people closer to the situation at hand (Harding 2001, Haraway 2001). Knowledge generated from a particular stance or view (my interpretation of standpoint epistemology) is, by definition, personal subjective knowledge, with all the motives and emotional "baggage" put hand-in-hand with "objective experience and facts." By calling for the integration of personal knowledge with institutional knowledge, we call for the blending of traditionally distinct worlds: the public sphere of science described by objectivity and non-emotive displays of knowledge; and a more private sphere of feelings and more subjective knowledge. My research will be designed to learn how these worlds interplay – how do we detect and define a partial perspective, and how do personal perspectives and social knowledge intersect with and inform one another?

Supporting these ideas, Shields (2005) addresses the normative nature of emotion through the viewpoint of psychology. In "Politics of Emotion in Everyday Life: 'Appropriate' Emotion and Claims on Identity," Shields describes the different "rules" that govern the degree to which it is "acceptable" to display different types of emotions in different situations (amount of emotion, and fit with situation). This work echoes Harding's thesis that who "owns" the knowledge often drives its acceptance (Harding, 1991) – in this case, Shields moves beyond "whose knowledge" to "whose emotion." Are emotional arguments expressed by researchers – if they are offered that way – more and less likely to impact scientific and technological directions?

Multiple perspectives may lead to conflict, anger, and fear. In my view, the potential emotional implications – and the potential psychological messiness - of feminist "theory in practice" is a vital element to explore in the research that lies ahead.

## Actor Network Theory and Interaction Rituals

My research will occur in the “laboratory life” of a specific scientific socio-technical network. My initial research also points to the importance of physical objects related to data sharing. For example, the data associated with and derived from biospecimens are of vital interest to researchers, for they represent the raw material from which research can be conducted. As such, actor network theory is another useful framework for shaping my research.

In this realm, the idea of object-oriented knowledge (Knorr Cetina, 1999) has steered me towards an attraction to human tissues (biospecimens) as a possible starting point for discussions about data sharing. Keeping objects – from biospecimens, to their associated data, to cancer therapies themselves - present as actors in my research, and noticing how a discussion of motives and emotions change depending on what objects are being considered, is an active goal of mine. Are discussions concerning human tissue more emotive than discussions about data derived from those tissues? How do discussions about sharing human biospecimens differ from the discussions about sharing the large genomic data sets that are derived from those tissues?

Latour’s work on “quasi-objects” helps inform this as well. First, as a concept, it helps reflect the continuum between “subject” (human donating tissue) and “object” (a data set derived using this tissue). My attraction to this theoretical tool also comes from the idea that motivation and emotion itself could be observed and exchanged as a quasi-object (Latour, 1993). If motivation and emotion is conceptualized as something that can be exchanged, we might be able to “trace” their pathways and possible impacts between individuals and the researchers they support.

Randall Collins’ work with interaction ritual chains, symbols, and emotional energy builds directly on these ideas (Collins, 2005). Working in the specialty of micro-sociology, Collins’ begins with the construct of *situations*, more specifically, points in time where two or more people are present with each other, and there is some kind of interaction ritual that either creates or lowers the level of emotional energy present. Often, this emotional energy is accompanied by the creation of symbols that maintain the emotion and energy at some level for some time after the event. Positioning both emotional energy and these symbols as “materials” transacted within a social setting, and which ultimately shape both individual development and social structure, Collins argues that emotional energy is the “X factor” that helps address social

patterns and phenomena that rational actor theory, social exchange theory, and macro-structural theories do not effectively explain.

Collins' work is diligent in targeting the boundary between the individual and social – arguing that our individualism is ultimately socially constructed, shaped by the emotional energy and symbols that are created, modified, or removed by each person's unique "interaction ritual chain." Our development as individuals comes as a result of a series of our face-to-face situational interactions with individuals or groups, with each situation defined as a potential "ritual" that generates emotional energy that either supports or detracts from that social interaction. "Rituals" can be as simple and informal as the repeated pattern of saying, "Hey, it's me" to a close friend, to the structured setting of a conference, where group identity is forged by structured rituals and events. In my case study, either positive or negative interactions related to the experience of data sharing may ultimately shape – or be shaped – by the larger social pressures related to this practice.

### **3.2. Conceptual Resources Related to the Data Sharing Debate**

Data sharing in cancer research has received great attention in political, scientific, technical and legal circles, offering a well defined baseline of social norms associated with the activity of data sharing. An article from 1946 sets the tone, arguing that collaborative research – a notion that goes hand in hand with data sharing – is required to fight the "war" on cancer:

Faced with a problem of such magnitude and complexity, we are inclined to think that its solution must await the chance discovery of some lone worker in the field at some unknown date in the future. In the meantime thousands annually die a lingering death at the hands of this killer. Actually, this menace should be regarded in the same light as any military foe that might claim the lives of thousands of Americans before their time--that is, the situation should be considered a national emergency. The AAAS is the official organization representing the majority of scientists in this country. Is there not some way in which the influence of this organization may be brought to bear to expedite an all-out, large-scale research campaign against public enemy No. 2?

Data sharing goes hand-in-hand with collaborative science; part of collaborating is sharing data with others. This quote also introduces the tool of metaphor into the spectrum, often used to argue the case for collaborative research, and the associated act of data sharing. Today, the NIH website positions data sharing as a priority, tying it directly to the grant awards:

NIH reaffirms its support for the concept of data sharing. We believe that data sharing is essential for expedited translation of research results into knowledge, products, and procedures to improve human health. The NIH endorses the sharing of final research data to serve these and other important scientific goals... Starting with the October 1, 2003 receipt date, investigators submitting an NIH application seeking \$500,000 or more in direct costs in any single year are expected to include a plan for data sharing or state why data sharing is not possible (NIH, Accessed 3/2008)

Data sharing and collaborative science are deceptively simple concepts. At first glance, the analogy between scientists sharing data and children sharing toys (a common metaphor among data sharing proponents) is a powerful and basic one. There are many factors, however, to discourage and hinder data sharing. Understanding these social-level factors points to potentially corresponding motives and emotions at an individual level. On the caBIG program, these factors are frequently described as progressive layers of an onion – each layer must be sequentially peeled off to remove the barriers to data sharing, and achieve the goals of collaborative research. The four layers are:

- Technical – Data sharing is currently hindered by a deficit in standards for data formatting and exchange. This makes data sharing difficult; even if I want to share my data, incompatible systems complicate both understanding and exchange.
- Legal – In cancer research, like any biomedical field, patient privacy laws and Institutional Review Board (IRB) guidelines related to human subjects research can hinder the sharing of patient derived data.
- Economic – Intellectual property rights and financial rewards play a role in limiting data sharing, particularly when sponsored research and commercial product development, such as pharmaceuticals are involved.
- Socio-cultural – Identified as the deepest factor, this factor acknowledges the impacts of the institutional rewards and interests long recognized by STS scholars as vital in shaping science and technology today.

While these factors are cited in a variety of literature on data sharing, other factors are cited as well: fear that data sharing will reveal research errors, poor quality, or researcher fraud; fear that sharing data will allow another researcher to preempt the original researcher on future questions, or that the context of the data will be misunderstood, causing data to be used

inappropriately in secondary research projects (Sterling, 1988; Ceci, 1988; Bishop, 2005; Dawyndt et al, 2006).

Even the researchers working to systematize and objectively remove data sharing barriers acknowledge a deeper emotional element. As an attendee at a caBIG open meeting on data sharing expressed, “There are private acknowledgements that ‘I don’t want to share data with that person because I hate their guts.’ We are never going to stop that kind of feeling. There’s a certain level of irrationality that we can’t address – but we can at least get it out there on the table to discuss.” (caBIG conference participant, January 2008).

Countering these complexities to encourage data sharing comes with its own sets of arguments, many designed to highlight the problems when these factors aren’t addressed. In my case study, for example, a metaphor used to communicate the program’s importance is the image of a “tsunami” of data facing cancer researchers (NIH, 2006) – clearly aiming to trigger emotions of feeling overwhelmed about the volume of data. A “Special Article” issued in Cancer Informatics (von Eschenbach, 2006), written by senior leaders in NIH, introduces other forms of metaphorical imagery, designed to highlight the confusion and chaos in the current landscape:

We are in the midst of an explosion of knowledge about cancer as a disease process..... Within the cancer research community there exists a “Tower of Babel” problem.... caBIG™ is being developed specifically to enable and accelerate the “bench-to-bedside-and-back” cycle.

As a second example, the March/April 2006 edition of Technology Review refers to caBIG™ with the title, “Cancer’s ‘World Wide Web’: A lung image database is breathing life into ‘medical grid’ vision.” Clearly, the “breathing life” metaphor is an attempt to invoke a feeling of positive affect for caBIG™ as collaborative science and data sharing are enabled through technology. It is this language, and its emotional implications that I am interested in studying further.

### **3.3. Conceptual Resources Related to Emotion**

A third category of literature reviewed for this proposal includes writings about motivation and emotion itself. This search was particularly daunting given the broad range of literature in different fields on this topic, and the broad range of definitions of the terms. As noted earlier, I wish to avoid a philosophical work on the nature and definition of emotion for this work. Instead,

I will accept Williams' conceptualization of emotion, developed to support his sociological research in health inequities (1998):

Emotions are complex, multi-faceted phenomena which are irreducible to any one domain or discourse. Emotions, in other words, are thinking, moving, feeling "complexes," which sociologically speaking are relational in nature and linked to "circuits of self-hood;" comprising both corporeal, embodied aspects, as well of socio-cultural ones. While basic emotions – rooted in our biological make-up and shared among all human beings as embodied agents – are involved, they are endlessly elaborated, like colors on a painter's palate, though time and culture.

Along with Williams (2001), Simon's comprehensive literature reviews on the social theory of emotion (1998) note a conceptual continuum of emotion, ranging from "organismic" (focused on an individualistic, biological conception of emotion) through "social constructionist" (focused on social actions placed in the world, and shaped by group processes). In the center of this continuum lie what he calls, "interactionist theories of emotion," which focus on the interaction between social signals (gathered through active engagement with the world) and individual meaning and interpretation (inner core of phenomenological experience). Like the work of Williams, Simons, and Collins discussed above, my research lies in this interactionist world.

Defining motivation is an equally elusive task. Motivation is generally defined as a force that that arouses someone to act towards a desired goal. Motives give purpose and direction to behavior. Like emotion, motivation can also be conceptualized from a highly individualized perspective (personal motivation towards "fight or flight" for example) to a more social level view (where people are motivated to conform to social norms). Again, a more middle-ground interactionist approach – linking personal motives to social action – is appropriate to my work.

As noted at the beginning of this paper, I wish to relate motivation and emotion to each other as follows: Motivation is that which inspires action, direction, and behavior towards a certain goal, and that emotions are the subjective feelings that occur when motives are either fulfilled or not. For the purposes of this research, I assume a close connection between the two: positive or negative emotions may motivate one to take an action; once that action is taken, positive or negative emotions may result.

Given this foundation, much of my research into emotions and motivation has been oriented towards identifying possible research methods. Using the theoretical frameworks above, how does one begin to "locate" motivation and emotion at the intersection of individual feeling and

social action? Most of us recognize someone working to influence someone, and the resulting emotional energy (to use Collins' term), when we see or experience it – a raised voice in a meeting, an argument in the hall, a passionate speech given by a leader. What methods are available for researching this type of event?

Two articles from the field of Organization Science illustrate how qualitative methods, including structured interviews and observation, have been used in organization settings to investigate emotions. Using these methods, both research teams were able to detect emotional patterns across similar situations in different organizations – allowing for generalized models of emotion, despite the personal nature of these feelings.

First, in “Toxic Decision Processes: A Study of Emotion and Organizational Decision Making,” Maitlis and Ozcelik (2004) focus on the role of negative emotion in influencing managerial decision-making, and the inter-play between individual negative emotion and a more systemic pattern of negative affect: “Although individual people experienced and enacted the feelings described here, the connections between actions and emotions, and even the emotions themselves, emerge significantly from organizational roles and relationships.”

In “Emotion as a Connection of Physical Artifacts and Organizations,” Rafaeli and Vilnai-Yavetz, 2004 described how people's descriptions of products universally included emotional reactions to the object, and to the overall organization, even when emotions were not directly requested by the researcher during structured interviews. Also of interest to my work, this study also recognized the role of symbols and metaphor in the emotional response itself (e.g, the object evoked imagery that was associated with an emotional response). Given the metaphor I have already encountered in my work in cancer research, and my interest in object-oriented analysis, the conceptual connection between an object, metaphor, and emotion seems a particularly rich one to integrate in my research.

Earlier, I referenced Shields' work on the acceptability of emotion displays. Work by Gray and Heatherington (2003) focused this work more specifically on the study of men, and explored the different expressions of emotions in small group settings. They found that the behavior of an audience (emotive versus neutral) tended to mediate the degree of emotional displays shown by the men, with the research subject's display of emotion correlated with the audience's level of emotive display. This study is interesting for both its method and its implication. This controlled

experiment employed only one emotion; and videotaping and coding methods were used to generate quantitative data related to emotional expression. The coding of positive and negative emotions, as well as the capturing of the intensity of displayed emotion, is likely to be a necessary part of my work. The deeper implication of interest to me is the suggestion that there is a normative force at play here, where emotional expression is dampened if the receiving party does not reciprocate. Did the norms and counter-norms of science, in fact, evolve through a “self-fulfilling prophecy” of single conversations over time, where participants mutually dampen or heighten emotional response in response to others’ cues?

Continuing this look at methods, Garot (2004) highlighted the difference between the study of experienced emotions, and the study of managed emotions. This appears to be a central tension in the study of emotion, particularly in anthropological research (Hochschild, 1979; Lutz and White, 1986). Which is the more important variable: the felt experience of emotion (phenomenological) and its consequences (e.g., how it impacts my decision to share data or not), or the displayed (managed) version and its impacts (e.g., how I share my experiences about data sharing with others)? Does the switch between the two actually demarcate the line between my partial perspective, and how I share that perspective with the social world?

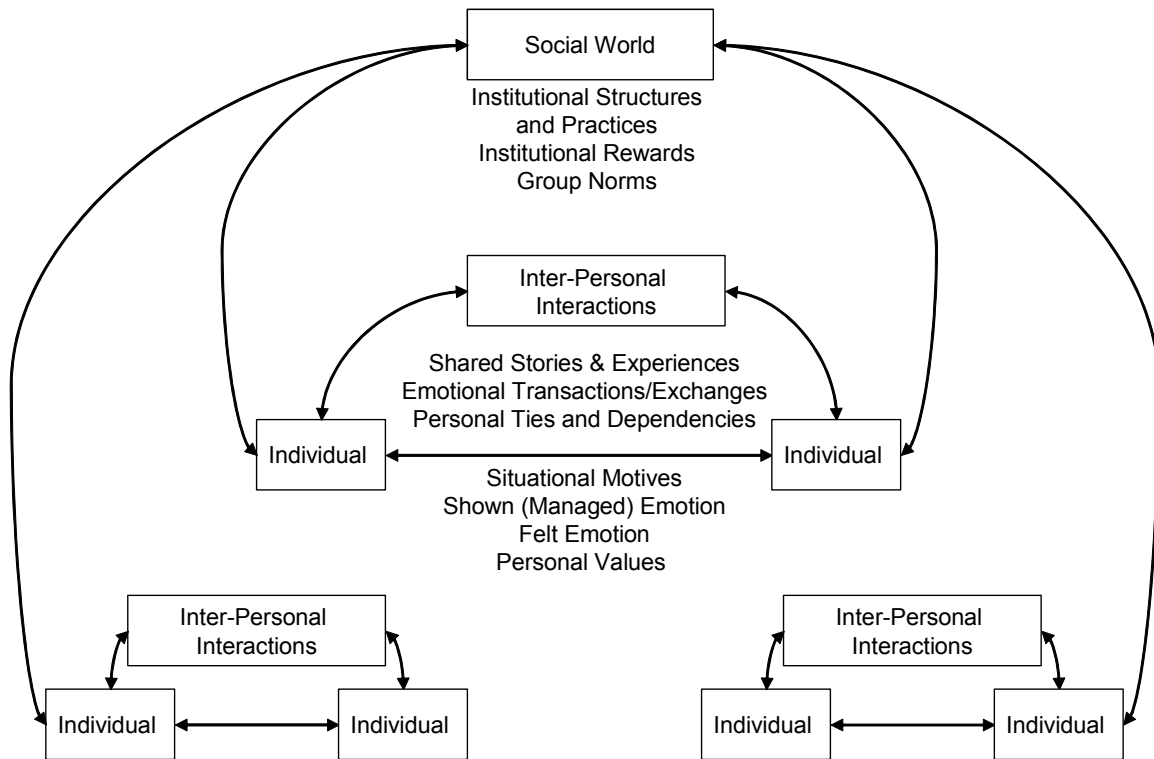
Where emotions are allowed, are people motivated to take action based on the emotions of others? Lewis (2000) addressed this question in a controlled study environment focusing on gender, and the role of negative emotion (anger and sadness) in shaping a leader’s perceived effectiveness. Lewis discovered that leaders were perceived less effective when they displayed anger and sadness than when they took a more neutral tone. On the positive side of affective leadership, Shamir et al (1993) and Conger and Kanungo (1987) propose that leaders are most effectively “charismatic” when they build positive self-concepts in their followers. This is consistent with general models of motivation, which presuppose that we are motivated to do what we do because we want to feel good about ourselves. Other outcomes attributed to successful charismatic leadership in these studies included organizational identification (wanting to do something for the larger organization) and values identification (the leader confirms the follower’s values). These are interesting categories of “outcomes” when considering motivation related to data sharing. Are arguments for or cautions against data sharing more likely to be accepted when they are related to a researcher’s goals, when they are framed within the larger goals of cancer research, or when they engage at a values level?

Weick et al (2005), Berscheid et al (2003) and Peters et al (2007) discuss the role of emotion with respect to task accomplishment and “making sense” of the activities and emotions that one experiences each day. “Sensemaking in organizations will often occur amidst intense emotional experience. As interdependent partners (e.g., partners exchanging data) learn more about each other and move toward closeness by becoming increasingly dependent on each other’s activities for the performance of their daily behavioral routines and the fulfillment of their plans and goals, the number and strength of their expectancies about each other increase. As a result, their opportunities for emotional experience also increase.” (Berscheid et al, 2003). Peters et al note, “Seemingly trivial social talk provides fertile ground for emotion sharing (a narrator and audience’s realization that they experience the same emotional response toward a target), which in turn creates a coalition. Weick et al (2005) may ask it best: Are “institutions are better portrayed as cold cognitive scripts built around rules or as hot emotional attitudes built around values?” I believe they are both, and aim to detect that diversity.

Micro-sociology offers other works related to the social theory of emotions. In “Emotion and Social Theory,” Williams (2001) provides a review of how emotion can be viewed through different sociological lenses, and how it could be used to help richen arguments related to societal power dynamics, the individual-social divide, and mind-body research. Barbalet (2001) in “Emotional, Social Theory and Social Structure,” also provides a survey of emotion in sociological contexts, but focuses instead on several specific emotions, such as confidence, fear, anger, conformity, resentment and shame. Both of these works are primarily theoretical and use literature reviews as a key foundation; they have helped shape this proposal in two key ways. First, I aim to build on William’s theoretical base into the applied realm, and explore whether observations support his theoretical arguments. Second, while Barbalet’s organization by emotion was instructive, it helped me eliminate that approach as an option in my research, as I am more interested in a wider range of motives across a socio-technical landscape.

#### **4. Proposed Research Methods**

The following figure outlines three levels of identify that appear at play in the dynamics associated with data sharing explored so far: Individual (personal emotions, motives, values), personal interactions with others (small group, one-on-one connections that allow for private exchanges of experience and interaction rituals), and the social world level (institutional norms, reward systems).



I believe that the personal decision to share data is informed by personal experience and the resultant emotions, stories and experiences shared with those close to us, and the social level pressures and norms that impact our professional status and economic livelihood. While I may fear not getting tenure or funding, I may also fear being looked down upon by a professional colleague. Am I feeling pressured to either share or not share because of a relationship with someone I trust and need, or pressures to share or not share because of broader institutional factors? The following section is designed to integrate the conceptual resources presented to this point into a tangible plan for the research itself.

My research approach is primarily ethnographic in nature, using focused interviews and observations of “science at work.” Interviews will be conducted at an individual level to detect the motives and emotions reported by researchers and others related to data sharing. Group observation will be used to observe how arguments at a social level related to data sharing differ or overlap with individual perceptions. How are any personal stories and experience filtered or translated to enter the public sphere of discussion about data sharing?

#### **4.1. Interviews with Researchers: Qualitative and Quantitative Data Gathering**

As noted previously, my work on the caBIG program provides with access to a variety of researchers and professionals with an interest and experience related to data sharing in cancer research environments. While some represent researchers at academic institutions (Cancer Centers), others represent grass roots organizations focused on the importance of data sharing, the private sector, the government, and patient advocate groups. This provides a diverse pool of potential research participants – each active within the social debate about data sharing in cancer research, but also with different backgrounds and social circles and interests. My interaction with each participant would cover three elements:

- A demographic and historical component to gather organizational position/role, domain of interest (type of cancer research), gender, reported personal experience with the act of data sharing, proximity with others that have had data sharing experience, and degree of connection to a person that actually has cancer (to assess whether a personal connection with someone with cancer impacts data sharing attitudes and motives).
- A qualitative interview to explore the participant's views on data sharing. This would be a structured ethnographic interview that would be initiated with the demographic and historical information, and move to either social arguments related to data sharing or personal emotions on the topic, depending on the path that the participant takes. My goal is to detect the emotions (if any) that arise in the discussion, and link them to either experiences or social norms.
- A quantitative ranking exercise to force the participant to identify which he or she finds more compelling: arguments supporting data sharing, or arguments that cite factors that hinder data sharing. This ranking exercise will also list a variety of reasons that would support or hinder data sharing, to see if there are any systematic relationships between the demographic information and these data.

Because I wish to relate individual feedback to group observations, I seek overlap between individual interviewees and the members of larger groups engaged in data sharing debates. As such, a list of candidate research subjects for this study would be compiled from public sources including caBIG program membership, meeting minutes, rosters for public meetings, and personal knowledge of people in the community. My goal would be to talk with approximately 40 people.

#### **4.2. Observations of the Social World: Public Arguments**

Given that my research is centered at the intersection of personal motivation and social norms, another research activity will involve observing group discussions related to data sharing, within the organizational construct of caBIG. These would include observing face-to-face meetings where data sharing is being discussed, and teleconferences addressing the topic. My emphasis would be to describe the type of discursive resources used to discuss data sources, and how that compares to the individual discussions. For example, are personal stories or emotionally-based displays evident in different proportions in a group than in the one-on-one interviews? What is the degree of passion versus non-emotive discussions? What are shared: objective statements related to legal and technical practice and requirements, or stories of personal experience? Where personal stories are shared, are these linked to institutional norms or motivations? I would plan to attend teleconferences on a monthly basis over at least a six month period, and face-to-face meetings when scheduled (based on past experience, two or three over a six month period).

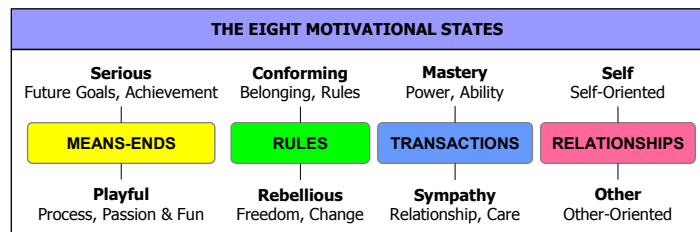
Supplementing these group observations, I would also review the products of these groups, as well as other published resources about data sharing. My casual observations to date suggest a similar pattern as noted both by Fraser (1989) and Haraway (2001): that personal discussions will yield more subjective perceptions and judgments related to data sharing, and that as this personal (or standpoint) knowledge is brought into the public sphere, that it will be translated or communicated in more objective terms. Tracing discourse from an individual level to a group level to a codified (published) level will help describe the path from standpoint epistemology to group norms, and what information is lost and gained along the way.

#### **4.3. Categorizing Motives and Emotions: A Proposed Structure**

Because motivation and emotion are perceived as such subjective phenomena, I have selected a systematic structure and taxonomy to help detect and categorize them. This is a model of emotion and motivation I frequently used in my own work in science and technology. Based on a structural phenomenological model from psychology called reversal theory (Apter, 2001), this taxonomy emphasizes the complexity, changeability, and inconsistency of motivation, emotion and behavior. The model proposes that humans regularly experience different emotions across

four motivational domains, each made up of an opposing pair of motivational states. Within each domain, emotions change, depending upon the specific values, meanings, and motives held by an individual in a situation. To impact one's own, or someone else's emotions, one must move oneself, or another, into a different motivational state. I believe that the four domains of reversal theory provide a useful organizing structure for considering the exchanges and experience of motivation and emotion among researchers. The domains are:

1. **Means-End** – Motives/emotions related to goals achievement versus engagement with process for its own sake.
2. **Rules Orientation** – Motives/emotions related to either belonging and adhering to rules/expectations, or rebelling and breaking outside of norms.
3. **Transactions** – Motives/emotions related to power and control (e.g. pride), or care and sympathy (e.g. compassion).
4. **Relationships** - Motives/emotions related to an individual's own interests, or the needs/interests of others.



I believe that reversal theory provides a useful structure for coding the motivational strategies and emotions that are seen during interviews and group sessions. For example, forcing participants to rank the motivators that contribute to their decisions to share data could provide valuable data for linking individual decisions with group norms. The following list provides eight factors that would support the personal decision to share data driven by reversal theory. Data sharing supports:

1. The achievement of important scientific and clinical goals.
2. The exploration of exciting new scientific paths.
3. Increased standardization and efficiency in the research process.
4. A revolution in the way science is done today.
5. My ability to compete for research grants and funding.
6. The identification of cures that might help me and my family.
7. The advancement of scientific knowledge for society.

## 8. Caring for humanity and the greater good.

This model is included in this methods section because it would serve as a practical research tool to support the investigative techniques described above. In addition, I have access to an academic group of reversal theory researcher to help validate coding decisions, ensuring my classification of content into the appropriate categories is true to the shared understanding of the theory.

## 5. Boundaries and Challenges

This section outlines the boundaries and challenges of my research. First, much of the literature in the philosophy of emotion focuses on the difficulty of defining emotions, and differentiating them from feelings, intuition, motivation and cognitive processes. The delineation between emotion, motivation and cognition is an area of debate, and I do not wish to become seduced by the intellectual complexities of the subject. This is a pragmatic and functional project, not a philosophical one. I am interested in action (to share or not to share), and how that decision is shaped and justified by both individual and social level arguments.

Second, I have concerns about how to describe my research with interview participants – do I treat them as co-participants in the research, sharing my intent and having them reflect upon that question knowing what the intent of the research is, or do I enter with a vague description about “investigating data sharing decision factors,” and allow the research question to unfold in the discussion itself? My literature suggests that personal stories and emotions are likely to be revealed simply by asking about someone’s experience and their rationale – and as such, describing the research goal is unnecessary; it will reveal itself on its own.

Third, because I am an active member of the community I am researching, I am concerned that any connection I already have with participants will impact their responses; people who already know and trust me will be more likely to share personal stories than those who don’t. What I detect as more subjective knowledge could be biased because of me, rather than the social relationships I am interested in. I am also concerned that due to busy schedules, the only people who will be willing to engage in interviews are ones that already have this connection.

In terms of boundaries, I am drawing a clear one around the case study I am exploring. While diverse in membership, caBIG as a large program represents a distinct social world that people

select into – I am limiting my work to this social world. This leaves out other communities that are engaged in data sharing problems on their own, as well as possible subspecialties within cancer research, such as body-site specific cancer groups (e.g., prostate cancer versus breast cancer). By including this variable in my demographic survey, however, I leave open the possibility of either expanding or limiting research along those lines if needed.

Finally, given my desire to conduct ideographic research in a very personal area (emotions), it is hard to imagine that the process of assessing emotions – or the memory of them - would not alter them. Just asking someone about their feelings may cause them to change or recall them differently, and lead the participant to be more reflexive about them in future interactions. The presence of an observer may even alter the norms of a group, introducing emotions that the group would not otherwise experience (i.e., conflict may be muted or expressions of vulnerability may be suppressed). While this is likely an unavoidable side-effect of this type of research, it is a risk to be acknowledged at the start of this process.

## **6. Proposed Dissertation Chapters**

Based on the discussion above, I anticipate the following chapters for a dissertation. This approach is subject to change as my work unfolds:

1. Introduction – Overview of research question, case study, key literature and research approach.
2. The Social World of Data Sharing - This section would outline the social norms and arguments related to data sharing, as well as historical context informing the topic. It would include a review of the key arguments and metaphor, with a discourse analysis of the underlying interests and norms indicated by this discussion.
3. The Private Decision: To Share or Not to Share – This section would summarize my research results at the individual level – personal arguments and experiences related to data sharing. Why do people report sharing data? How many are doing so?
4. The Exchange Space – This section would integrate the personal and the social, focusing on how the personal and social levels appear to influence and interplay with one another. This chapter would include a model for how I believe partial perspectives and social norms inform one another, based on the outputs of individual interviews, social level observations, and reviews of published products related to data sharing.

5. Discussion and Conclusions – This chapter would strive to integrate my research results into the existing STS body of knowledge, with suggestions for future research directions and possible methods for those interested in this work. Given my interest in advocacy, this section would also include possible recommendations for those internal to cancer research.

## **7. Summary and Desired Contribution**

The overarching goal of my research is to detect systematic patterns of motivation and emotion in activities and language that influence the personal decisions and social norms of scientific research. By “detecting” motivational states in justification statements, objections, and metaphor at both personal and social, we may be able to suggest new arguments that trigger alternative motivational states and ultimately different actions. My work is overtly values-driven, and is intended – to have an activist bent. My desire is to describe a versatile “emotional toolbox” – reframing emotional resources as valuable sources of influence and power, rather than as distasteful “baggage” to be left at the door.

**Proposed Dissertation Project Plan**  
Jennifer Tucker, August 2008

<b>Activity</b>	<b>Target Date</b>
Complete draft IRB submission for review by Committee (Allen & Zallen)	18 August 08
Continue ongoing literature and background research while Phase 1 is being initiated	18 August – 15 September 08
Submit IRB paperwork for review/approval	25 August 08
Receive IRB approval (projected)	8 September 08
Begin formal attendance at caBIG Data Sharing Conferences/ Telecoms to support group dynamics data gathering	8 September 08
Invite Phase 1 Interviewees to participate	9-12 September 08
Conduct Phase 1 Interviews (5-10)	15-26 September 08
Analyze Phase 1 Data and prepare summary for committee to consider	29 September – 10 October 08
Revise interview protocol as needed based on Phase 1 results and committee feedback	10-17 October 08
Invite Phase 2 Interviewees to participate	17-24 October 08
Conduct Phase 2 Interviews (20-30)	27 October – 19 December 08
Process Phase 2 data and identify second interview needs	22 December – 27 February 09
Conduct second interviews as needed	16 January – 27 February 09
Stop formal attendance at caBIG Data Sharing conferences (6 month mark)	27 February 09
Continue to analyze data from Phase 1 and 2, as well as data from telecom group observations and ongoing literature search	16 January – 27 March 09
Complete Draft Chapter 1 and 2 (Introduction and Macro View of Data Sharing – Social Level Discourse/Norms of Data Sharing)	1 April 09
Complete Draft Chapter 3 (Individual Motivation and Experiences - Data Sharing)	1 May 09
Complete Chapter 4 (Integrating Personal Motivation and Social Norms – Mapping the Discourse and the Feedback)	1 June 09
Complete Chapter 5 (Implications for STS, Future Research Directions, Conclusions)	1 July 09
Receive and make revisions to all chapters based on Committee Comments as received	1 July – 1 August 09
Dissertation Completion and Defense	15 August 09

## 8. Appendices

Appendices to this draft proposal include an acronym list, a bibliography, and a proposed interview list of 60 people. It will be supplemented by draft questionnaires and materials for Institutional Review Board (IRB) consideration.

### 8.1. Acronyms

caBIG™	Cancer Biomedical Informatics Grid
IRB	Institutional Review Board
IT	Information Technology
NIH	National Institutes of Health
NCI	National Cancer Institute

### 8.2. Bibliography

1. Apter, M. J. (2001). Motivational styles in everyday life : a guide to reversal theory. Washington, DC, American Psychological Association.
2. Barbalet, J. (2001). Emotion, Social Theory & Social Structure. Cambridge, Cambridge University Press.
3. Berscheid, E. and H. Ammazzalorso (2003). Emotional experience in close relationships. Blackwell Handbook of Social Psychology: Interpersonal Process. G. J. Fletcher and M. S. Clark, Blackwell, Malden, MA: 308-330.
4. Bishop, L. (2005). "Protecting Respondents and Enabling Data Sharing: Reply to Parry and Mauthner." Sociology **39**(2): 333-336.
5. Blakely, K. (2007). "Reflections on the Role of Emotion in Feminist Research." International Journal of Qualitative Methods **6**(2).
6. Bourke, J. (2006). Fear: a cultural history. Emeryville, CA, Shoemaker Hoard: Distributed by Publishers Group West.
7. Buetow, K. (2008). "Heading for the BIG Time." The Scientist **22**(4): 60.
8. Cahill, C. (2007). "The Personal is Political: Developing new subjectivities through participatory action research." Gender, Place & Culture **14**(3): 267-292.
9. Ceci, S. J. (1988). "Scientists' Attitudes toward Data Sharing." Science, Technology, & Human Values **13**(1/2): 45-52.
10. Clarke, A. E., J. K. Shim, et al. (2003). "Biomedicalization: Technoscientific Transformations of Health, Illness, and U.S. Biomedicine." American Sociological Review **68**(2): 161-194.

11. Collins, R. (2004). Interaction ritual chains. Princeton, N.J., Princeton University Press.
12. Conger, J. A. and R. N. Kanungo (1987). "Toward a Behavioral Theory of Charismatic Leadership in Organizational Settings." The Academy of Management Review **12**(4): 637-647.
13. Davis, D (2007) The Secret History of the War on Cancer. Basic Books.
14. Dawyndt, P., T. Dedeurwaerdere, et al. (2006). "Contributions of bioinformatics and intellectual property rights in sharing biological information." International Social Science Journal (ISSJ) **188**: 249-258.
15. Fraser, N. (1989). Unruly practices : power, discourse, and gender in contemporary social theory. Minneapolis, University of Minnesota Press.
16. Goodwin, J., J. M. Jasper, et al. (2001). Passionate politics: emotions and social movements. Chicago, University of Chicago Press.
17. Garot, R. (2004). "You're Not a Stone: Emotional Sensitivity in a Bureaucratic Setting." Journal Of Contemporary Ethnography **33**(6): 735-766.
18. Gray, S. M. and L. Heatherington (2003). "The Importance of Social Context in the Facilitation of Emotional Expression in Men." Journal of Social and Clinical Psychology **22**(3): 294-314.
19. Haraway, D. (2001). Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspectives (1988). The Gender and Science Reader. M. Lederman and I. Bartsch. London and New York, Routledge: 169-188.
20. Harding, S. (2001). Feminist Standpoint Epistemology. The Gender and Science Reader. M. Lederman and I. Bartsch. London and New York, Routledge: 145-168.
21. Hochschild, A. R. (1979). "Emotion work, feeling rules, and social structure." American Journal of Sociology **85**(3): 551-75.
22. Holland, J. (2006). "Emotions and Research." International Journal of Social Research Methodology **10**(3): 195-209.
23. Knorr Cetina, K. D. (1999). Epistemic Cultures. How the Sciences Make Knowledge. Cambridge, Harvard University Press.
24. Latour, B. (1993). We have never been modern. Cambridge, Mass., Harvard University Press.
25. Lawler, E. J. and S. R. Thye (1999). "Bringing Emotions into Social Exchange Theory." Annual Review of Sociology **25**: 217-244.
26. Lewis, M. and J. M. Haviland-Jones (2004). Handbook of emotions. New York, Guilford Press.

27. Lewis, K. M. (2000). "When Leaders Display Emotion: How Followers Respond to Negative Emotional Expression of Male and Female Leaders." Journal of Organizational Behavior **21**(2): 221-234.
28. Lutz, C. and G. M. White (1986). "The Anthropology of Emotions." Annual Review of Anthropology **Vol. 15**: 405-436.
29. Mashberg, T. (2006) Cancer's "World Wide Web:" A lung image database is breathing life into "medical grid" vision. Technology Review **Volume: March/April 2006**
30. Merton, R. K. (1973). The sociology of science : theoretical and empirical investigations. Chicago, University of Chicago Press.
31. Mitroff, I. (1974). "Norms and Counter-Norms in a Select Group of Apollo Moon Scientists: A Case Study in the Ambivalence of Scientists." American Sociological Review **39**: 579-595.
32. Maitlis, S. and H. Ozcelik (2004). "Toxic Decision Processes: A Study of Emotion and Organizational Decision Making." Organization Science **15**(4): 375-393.
33. Moldoveanu, M. C. and N. Nohria (2002). Master passions : emotion, narrative, and the development of culture. Cambridge, Mass., MIT Press.
34. Morgan, G. (1998). Images of organization. San Francisco, Calif; Thousand Oaks, Calif., Berrett-Koehler Publishers; Sage Publications.
35. National Institutes of Health (2003). "Final NIH Statement on Sharing Research Data" February 26, 2003 (Accessed at: [http://grants.nih.gov/grants/policy/data\\_sharing/](http://grants.nih.gov/grants/policy/data_sharing/), 3/2008)
36. Peters, K. and Y. Kashima (2007). "From Social Talk to Social Action: Shaping the Social Triad With Emotion Sharing." Journal of Personality and Social Psychology **93**(5): 780–797.
37. Pilcher, K. S. (1946). "Coordination of Cancer Research." Science **104**(2694): 167-168.
38. Rafaeli, A. and I. Vilnai-Yavetz (2004). "Emotion as a Connection of Physical Artifacts and Organizations." Organization Science **15**(6)(Nov-Dec. 2004): 671-686.
39. Rolin, K. (1999). "Can Gender Ideologies Influence the Practice of the Physical Sciences?" Perspectives on Science **7**(4): 510-533.
40. Scherer, K. (2005). "What are emotions? And how can they be measured?" Social Science Information **44**(4): 695-729.
41. Shamir, B., R. J. House, et al. (1993). "The Motivational Effects of Charismatic Leadership: A Self-Concept Based Theory." Organization Science **4**(4): 577-594.
42. Shrum, W., I. Chompalov, et al. (2001). "Trust, Conflict and Performance in Scientific Collaborations." Social Studies of Science **31**(5): 681-730.
43. Shields, S. A. (2005). "The Politics of Emotion in Everyday Life: 'Appropriate' Emotion and Claims on Identity." Review of General Psychology **9**(1): 3-15.

44. Simons, W. (1998). "'Capitalising' on Emotions? Rethinking the Inequalities in Health Debate." Sociology **32**(1): 121-139.
45. Sterling, T. D. (1988). "Analysis and Reanalysis of Shared Scientific Data." Annals of the AAPSS **495**: 49-60.
46. Traweek, S. (1999). Pilgrim's Progress: Male Tales Told During a Life in Physics (1988). The Science Studies Reader. M. Biagioli. London and New York, Routledge: 525-542.
47. Weick, K. E., K. M. Sutcliffe, et al. (2005). "Organizing and the Process of Sensemaking." Organization Science **16**(4): 409-421.
48. Williams, S. (2001). Emotions and Social Theory. London, Sage Publications.
49. Ziman, J. (2000). New modes of knowledge production. Real Science: What It Is and What It Means. Port Chester, NY, Cambridge University Press: 56-82.

### **8.3. Proposed Initial Interview List**

Removed to protect the privacy of final interviewees.